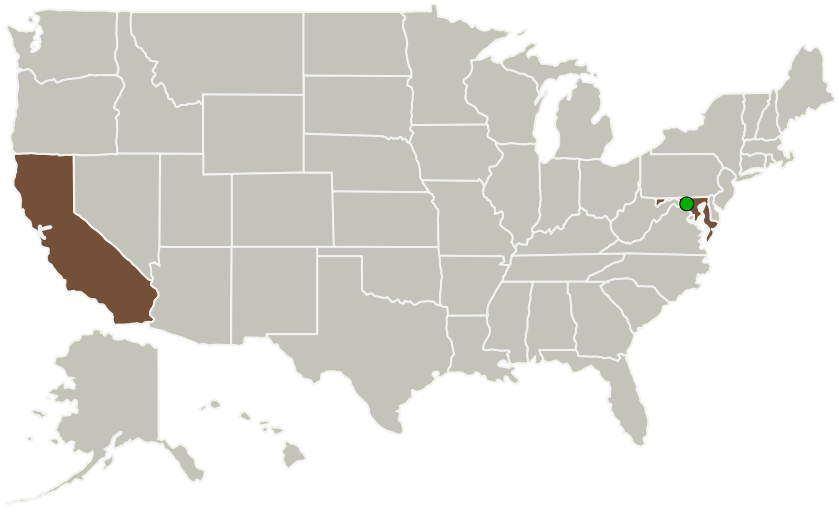
Deep Space Navigation and Timing Architecture and Simulation, Phase II

Completed Technology Project (2011 - 2013)

Project Introduction

The Microcosm team will complete the simulation tool architecture early in Phase II, and in parallel begin to develop the simulation. The tool is architected for carrying out performance analysis and rapid trade study assessments of competing navigation/timing architecture options for future NASA missions, incorporating state-of-the art radiometric, x-ray pulsar, and laser communications measurements, among others, in the Orbit Determination Toolbox (ODTBX) environment. The solution centers on inclusion of a navigation layer as part of the communications architecture and on the maintenance and propagation of navigation states, time and associated uncertainties onboard each platform with filtering capabilities enabling updates based on any available measurements. Such measurements include: direct state and uncertainty updates via ground communication, radiometric- and lasercom-based range and range rate data from communication with ground stations and other spacecraft, time transfer from ground stations and other spacecraft, X-ray pulsar-based navigation and time measurements (XNAV), and others as they become available. This would be game-changing for spacecraft autonomy ➧enabling platforms to operate using onboard state information rather than relying almost entirely on ground based tracking and activity scheduling. Additionally, architectures that include long-range intersatellite communication (e.g. relay spacecraft) can provide favorable geometries for significantly improved 3D precision navigation solar-system-wide.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Microcosm, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Hawthorne, California
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
California	Maryland

Project Transitions

June 2011: Project Start

March 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138788)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Microcosm, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

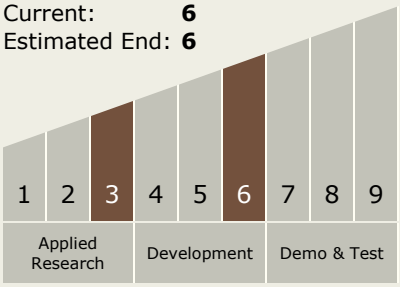
Carlos Torrez

Principal Investigator:

Paul Graven

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.3 Navigation Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System